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**BEFORE THE
PUBLIC SERVICE COMMISSION OF WISCONSIN**

Application for Grant County Solar, LLC to Construct a New
Solar Electric Generation Facility located near Potosi and Harrison Townships, in Grant County, Wisconsin

Docket No. 9804-CE-100

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REBUTTAL TESTIMONY OF VALERIE LOCKER

13 **Q. Are you the same Valerie Locker who filed direct testimony in this proceeding?**

14 A. Yes.

15 **Q. What is the purpose of your rebuttal testimony?**

16 A. I am responding to certain portion of the direct testimony filed by Public Service
17 Commission of Wisconsin (“PSW” or “Commission”) witness Tyler Tomaszewski and
18 Grant County Intervenor (“GCI”) witnesses Preston and Jennifer Adrian, Daniel Cray,
19 Brianna Eisenstout-Frear and Henry Frear, Ross Reynolds, and Kelsey and Travis Wagner.
20 (collectively, the “GCI Witnesses”). Specifically, I address the following topics: avian
21 monitoring, endangered resource review, wetlands and waterways, water supply,
22 stormwater management, wildlife habitat and threatened or endangered species,
23 agricultural land, and visibility. I also discuss the vegetation management plan that was
24 developed for the Project, and the potential for a Photovoltaic Heat Island (“PVHI”) impact
25 to occur at the Project Site.

26 **Q. Are you sponsoring any exhibits with your testimony?**

27 A. Yes. I am sponsoring the following exhibits:

28 Ex.-Grant County Solar-Locker-6: U.S. Department of Agriculture, Farmland Protection
29 Policy Act: Program Overview and NRCS Responsibilities.

1 Ex.-Grant County Solar-Locker-7: Photo Location and Layout Map.

2 Ex.-Grant County Solar-Locker-8: DATCP Wisconsin Farmland Preservation Program.

3 Ex.-Grant County Solar-Locker-9: U.S. Department of Agriculture, Farm Service Agency,
4 Conservation Reserve Program.

5 **Avian Monitoring**

6 **Q. Does Mr. Tomaszewski have a concern with respect to the study of avian mortality?**

7 A. Mr. Tomaszewski states that \$4.3 million has been granted by the U.S. Department of
8 Energy to three projects to study solar facilities and avian impacts in the Midwest.
9 Mr. Tomaszewski acknowledges that negative impacts to birds from a solar facility are
10 likely to be less significant than impacts from building window strikes or cats. (Direct-
11 PSC-Tomaszewski-9). Nevertheless, Mr. Tomaszewski asserts that the Commission
12 “could require Grant County Solar [to] participate in a post-construction avian impact study
13 to build knowledge” of avian impacts in the upper Midwest.

14 **Q. Does Grant County Solar believe a post-construction avian mortality study is
15 necessary for the Project?**

16 A. No. As discussed on pages 9-12 of my Direct Testimony, the Grant County Solar site is a
17 low risk site for avian collisions. Based on research from multiple sources (including U.S.
18 Fish and Wildlife Service (“USFWS”) and independent scientists), there are various
19 anthropogenic causes of avian mortality. (See Ex.-Grant County Solar-Locker-3). As
20 Mr. Tomaszewski acknowledges, the greatest avian mortality causes are cats and collisions
21 with buildings and vehicles. Avian fatalities due to wind turbines have been extensively
22 studied in the U.S. and are consistently found to cause less than one percent of all avian
23 fatalities. (See Ex.-Grant County Solar-Locker-3). Assuming that photovoltaic (“PV”)

1 solar results in less avian mortality than wind turbines due in part to the stationary nature
2 and lower profile of PV solar in comparison to wind, avian mortalities at this facility will
3 not impact avian populations regionally or nationally. Additionally, Grant County Solar is
4 not aware of any documented impacts of avian species within solar sites in the Midwest.

5 Moreover, Grant County Solar does not believe that the lake effect hypothesis (*i.e.*,
6 evaluation of reflective surfaces of panels and orientation leading to perception as
7 wetland/open water by waterfowl or other birds) is applicable to the Project given its
8 proximity to naturally occurring bodies of water, including the Mississippi River, located
9 approximately 4 miles south of the Project, and major tributaries. Importantly, studies on
10 this hypothesis are generally conducted in dry, arid landscapes with respect to solar
11 facilities that cover large land areas. NextEra Energy Resources, LLC (“NEER”), the
12 indirect parent of Grant County Solar, has found to date that there are no population level
13 impacts on species found at solar projects. In addition, NEER is participating in and
14 partially funding a study led by the United States Geological Survey (“USGS”) on the lake
15 effect hypothesis in the desert southwest where it is thought the phenomenon may be more
16 prevalent due to the area being one of the most water-poor places on Earth.

17 The area of the Mississippi River flyway where the Project is located is nearby
18 other suitable habitat that is available for utilization, including the Mississippi River and
19 its major tributaries, and clearly offers more natural conditions for water-dependent birds
20 and other avian species. In comparison, the desert Southwest, where the previously
21 mentioned studies were conducted, is significantly different from the Mississippi River
22 flyway as temperatures in the desert Southwest can rise as high as 120°F and water
23 resources are scarce. With respect to reflection, solar panels, including the panels which

1 will be used for the Project, are designed to absorb light rather than reflect it. Nevertheless,
2 the tracking panels in the array at the Grant County Solar Project will include anti-
3 reflection coating.

4 Moreover, post-construction avian mortality monitoring will be conducted at both
5 the 300 MW Badger Hollow Solar generation facility located in Iowa County, which is
6 adjacent to Grant County and approximately thirty miles from the Project, and the Two
7 Creeks Solar Facility in Manitowoc and Kewaunee Counties. *See*, Docket 9697-CE-100,
8 *Application for a Certificate of Public Convenience and Necessity of Badger Hollow Solar*
9 *Farm, LLC to Construct a Solar Electric Generation Facility, to be Located in Iowa*
10 *County, Wisconsin*, Final Decision, issued on April 18, 2019 (PSC REF#: 364425); *see*
11 *also*, Docket 9696-CE-100, *Application for a Certificate of Public Convenience and*
12 *Necessity of Two Creeks Solar, LLC to Construct a Solar Electric Generation Facility, to*
13 *be Located in Manitowoc and Kewaunee Counties, Wisconsin*, Final Decision, issued on
14 April 18, 2019 (PSC REF#: 364423). The avian studies at these geographically diverse
15 solar generation facilities, which share the same fundamental technology as the Grant
16 County Solar Project, will provide the Commission with a scientifically meaningful basis
17 to address this issue. Moreover, the Project Site has similar vegetation, avian habitat, and
18 is in general environmentally like the Badger Hollow Solar site. Thus, any additional study
19 of avian mortality at the Grant County Solar Project Site would be redundant, costly, and
20 unnecessary. Importantly, the Commission implicitly recognized the redundancy of such
21 a study when it declined to require an avian mortality study in the Point Beach Solar
22 proceeding. (*See generally* Docket No. 9804-CE-100, *Application for a Certificate of*
23 *Public Convenience and Necessity of Point Beach Solar, LLC to Construct a Solar Electric*

1 *Generation Facility, to be Located in Manitowoc County, Wisconsin*, Final Decision,
2 February 12, 2020 (PSC REF#: 383720) (“Point Beach Solar Final Decision”) p. 29.

3 Therefore, with no knowledge or data of any documented avian mortality at solar
4 sites in the Midwest, evaluation of the Project demonstrating low risk for avian collisions,
5 Grant County Solar’s voluntary implementation of a Wildlife Response and Reporting
6 System (“WRRS”), and formal post-construction mortality monitoring planned for another
7 project in close proximity to the Project, additional post-construction avian mortality
8 monitoring for this Project would be duplicative and unnecessary.

9 **Q. In his testimony, Mr. Tomaszewski requests that Grant County Solar provide the**
10 **Commission and DNR Staff annual reports of Grant County Solar’s WRRS. (Direct-**
11 **PSC-Tomaszewski-10). Is Grant County Solar willing to provide the Commission**
12 **and DNR Staff annual reports of Grant County Solar’s WRRS?**

13 A. Yes. Grant County Solar will provide the Commission and DNR staff with annual reports
14 of Grant County Solar’s WRRS if the Commission determines that such reporting is
15 reasonable and necessary.

16 **Endangered Resource Review**

17 **Q. Ms. Rowe and Mr. Tomaszewski suggest a certificate condition requiring an updated**
18 **endangered resources review closer to the construction start date. (Direct-PSC-Rowe-**
19 **5; Direct-PSC-Tomaszewski-13). Does Grant County Solar agree with that request?**

20 A. Yes. As stated on page 13 of my Direct Testimony, Grant County Solar will update its
21 endangered resources review when it gets closer to the construction start date, not more
22 than one year prior to commencement of construction.

Wetlands and Waterways

1
2 **Q. What is your response to concerns expressed by GCI witnesses Kelsey and Travis**
3 **Wagner that the Project will negatively impact wetlands and waterways (Direct-GCI-**
4 **Wagner-6)?**

5 A. I disagree. As set forth on pages 5-6 of my Direct Testimony, consistent with Wis. Stat.
6 § 196.491(3)(d)3 and 4, the Project is designed to avoid temporary or permanent impacts
7 to wetlands and waterways. The Project includes minimum 20-foot setbacks around
8 wetlands and 75-foot setbacks around both field delineated and Wisconsin Department of
9 Natural Resources (“WDNR”) mapped waterways. Underground collection line crossings
10 of waterways and wetlands within both the Proposed Array and Alternative Array will be
11 installed via Horizontal Directional Drilling (“HDD”). As described below, indirect
12 impacts to wetlands and waterways resulting from stormwater runoff will be minimized
13 under the Project’s Stormwater Management Plan.

14 No sensitive wetlands, state or federally listed waterways, trout streams, fisheries,
15 wilderness areas, wild or scenic rivers, recreational areas, or other sensitive resources of
16 state or federal concern will be impacted by construction activities. Moreover, no surface
17 waters identified as outstanding or exceptional resources (Wis. Admin. Code Ch. NR 102)
18 will be impacted. Thus, no undue adverse effect to environmental values relating to
19 ecological balance including wetland functions and relating to recreational use will occur
20 as a result of the Project.

21 **Q. Does the WDNR agree with your conclusion?**

22 A. Yes. Direct Testimony submitted by WDNR witness Tekler states “[n]one of the wetlands
23 or waterways within the project area are proposed to be impacted, as avoidance of these

1 sensitive areas was achieved due to siting project components outside of their boundaries,
2 avoiding traversing across these areas with vehicles and equipment, and by utilizing
3 trenchless underground installation for collection lines.” (Direct-WDNR-Tekler-3).

4 Water Supply

5 **Q. GCI witnesses Preston and Jennifer Adrian raise concerns that the Project will**
6 **adversely impact the safety of their water supply. (Direct-GCI-Adrian-4). Do you**
7 **agree?**

8 A. No, I do not. First, the temporary removal of the land within the Project area from
9 agricultural usage during the lifespan of the Project will reduce the runoff from pesticides
10 and allow the land to rest as managed perennial grassland. Moreover, modern PV solar
11 panels are made of materials typical of those found in electronic equipment and are
12 encased, so as not to pose a concern for the water supply or public health.¹ The composition
13 of the type of solar panels under consideration for the Project is addressed further in the
14 Rebuttal Testimony of Grant County Solar witness Paul Callahan.

15 Stormwater Management

16 **Q. The GCI witnesses state that they have concerns with water drainage and stormwater**
17 **runoff at the Project Site. (Direct-GCI-Cray-7-8; Direct-GCI-Reynolds-1-2; Direct-**
18 **GCI-Wagner-6). How will stormwater be controlled at the Project Site during both**
19 **construction and operation?**

20 A. The Project will be designed to manage any permanent changes in stormwater runoff
21 resulting from development of the Project, and will be required to obtain authorization
22 under the Wisconsin DNR General Permit to Discharge under the Wisconsin Pollutant

¹ “Health and Safety Impacts of Solar Photovoltaics,” N.C. State University, N.C. Clean Energy Technology Center, May 2017.

1 Discharge Elimination System WPDES Permit No. WI-S067831-5 (“WDNR Stormwater
2 General Permit”) prior to the commencement of construction. Temporary stormwater best
3 management practices (“BMPs”) will be used during Project construction, and construction
4 will be completed in accordance with the WDNR Stormwater General Permit and project-
5 specific Erosion Control and Storm Water Management Plans. Temporary stormwater
6 BMPs may include but are not limited to: phased construction, temporary seeding,
7 perimeter protection (*e.g.*, silt fence/filter sock), vegetative buffers, and sediment traps.
8 Appendix R is the Preliminary Erosion Control Plan and Stormwater Plan. Final Erosion
9 Control and Stormwater Management Plans will be submitted to and approved by WDNR
10 prior to the commencement of Project construction.

11 In addition, a permanent stormwater basin will be constructed on the north side of
12 the substation to manage and treat stormwater runoff. The proposed basin location is
13 shown in Grant County Solar’s Response to PSCW Data Request No. 1.02, Attachment
14 1.02. The basin will be designed to control the discharge rate of a 100-year storm event per
15 the WDNR Stormwater General Permit. The size of the basin will be determined during
16 final Project design.

17 The basin location and design will maintain existing hydrologic flow patterns.
18 Stormwater will enter the basin via sheet flow from the south and east. The location of the
19 basin is a natural concentration point that continues flow to the north. The basin will outlet
20 to the north along the natural drainage route. Surface reinforcement will be utilized where
21 necessary to reduce erosion potential. Because the soils in the substation area are primarily
22 Lean Clay (CL), which are Hydrologic Soil Group D, it is anticipated that a wet basin will
23 be used.

1 Moreover, the majority of the Project Site, including areas beneath and around
2 arrays, will be planted with perennial vegetation and managed as grassland. Stormwater
3 infiltrates soil at a higher rate on perennial grassland than on cultivated cropland. As such,
4 the change to perennial vegetation will manage additional runoff resulting from the solar
5 modules and access roads.

6 Once constructed, permanent stormwater facilities and perennial vegetation will be
7 managed in accordance with the WDNR stormwater permits applicable to the Project. In
8 contrast to agriculture, the Project will not require regular ground disturbance once the
9 Project is constructed and vegetation is established.

10 **Q. How do these measures address potential soil erosion?**

11 A. Temporary stormwater BMPs implemented during construction minimize potential soil
12 erosion through a combination of erosion and stabilization practices, which minimize
13 causes of erosion, and sediment control practices, which minimize the spread of sediment
14 off-site.

15 Establishing perennial vegetation across the majority of the Project Site, including
16 beneath and around arrays, will manage erosion by increasing stormwater infiltration. The
17 proposed permanent stormwater basin will manage any increase in stormwater runoff
18 associated with the substation and maintenance building, thus preventing downstream
19 issues from increased runoff and erosion. Thus, adverse impacts to water quality are
20 unlikely to occur as a result of erosion or stormwater runoff from development and
21 operation of the Project.

1 **Q. How will impacts to drainage tiles be avoided?**

2 A. As set forth in Sections 5.13.2 and 5.13.3 of the Application, to the extent possible and to
3 the extent they exist, major tile channels will be completely avoided. If impacts to a major
4 tile line are unavoidable, the tile line will be rerouted post-construction. If drainage tile is
5 damaged, cut, or removed as a result of trenching, it will be repaired or replaced depending
6 on structural conditions. Grant County Solar will make efforts to complete permanent tile
7 repairs within a reasonable timeframe, taking into account weather and soil conditions.

8 **Wildlife Habitat and Threatened or Endangered Species**

9 **Q. GCI witness Daniel Cray states that the Project will “change the environment in this
10 area forever” with resulting changes “to the wildlife.” (Direct-GCI-Cray-8). Will the
11 Project destroy or significantly imperil the habitat of federally or state-listed T&E
12 species?**

13 A. No. As discussed on pages 7-8 of my Direct Testimony, the Project will have minimal
14 impact on wildlife species in general, or their preferred habitats because the majority of
15 impacts from construction and operation will be on actively tilled agricultural land.
16 Wetlands and forested habitat within the Project Study Area has been avoided to the extent
17 practicable. Therefore, impacts to preferred wildlife habitat have been minimized.
18 Avoidance of wetlands and waterways with large setbacks has provided numerous
19 corridors running between the fenced-in array areas that will allow for safe passage of
20 wildlife. Moreover, the Project will use deer fencing around solar arrays, which the
21 Commission determined in the recent Point Beach Solar proceeding is “less hazardous to
22 wildlife.” (Point Beach Solar Final Decision, p. 26). In this way the Project will not cause

1 any undue adverse impact relating to wildlife or the environmental value of ecological
2 balance. *See* Wis. Stat. §§ 196.491(3)(d)4.

3 Moreover, after consultation with USFWS and WDNR, it was determined that no
4 pre-construction studies were required if tree clearing either occurs outside the northern
5 long-eared bat and affected migratory birds of concern roosting and nesting seasons, and
6 follows USFWS guidelines regarding acceptable dates for clearing in Wisconsin and Grant
7 County Solar has appropriate surveys conducted prior to construction to avoid impacts to
8 active roosts or nests; or coordinates with WDNR prior to construction. WDNR further
9 indicated within the approved Endangered Resources Review that although one state
10 threatened fish and one state endangered amphibian have been recorded within the
11 surrounding area, there is a lack of suitable habitat within the Project Study Area for these
12 species. Therefore, no actions were required by WDNR to comply with state/federal
13 endangered species law or recommended to help conserve Wisconsin's endangered
14 resources (Ex.-Grant County Solar-Application: Appendix M).

15 As such, the Project will have minimal impacts on wildlife due to the avoidance
16 and minimization strategies implemented and is designed to be fully decommissioned at
17 the end of the Project lifespan, allowing the land to return to agricultural use.

18 **Agricultural Land**

19 **Q. GCI witnesses assert that the Project Site is “protected land under the Farmland
20 Protection Policy Act.” (Direct-GCI-Frear-3-4; Direct-GCI-Cray-7; Direct-GCI-
21 Wagner-4). Do you agree?**

22 **A.** No. While I am not an attorney, my understanding is that the Federal Farmland Protection
23 Policy Act (“FPPA”) is not applicable to private and/or non-federal projects such as the

1 Grant County Solar Project. The FPPA is intended to minimize the irreversible conversion
2 of farmland resulting from federal projects, (*i.e.*, projects completed by a federal agency or
3 with support of federal funding). It is my understanding that the FPPA does not authorize
4 the regulation of farmland for private or non-federal projects, such as the Project and thus,
5 the Project is not subject to FPPA regulation. (*See Ex.-Grant County Solar-Locker-6*).

6 In addition to the FPPA, the Wisconsin Farmland Preservation Program (“WFPP”)
7 is administered by the Department of Agriculture, Trade and Consumer Protection
8 (“DATCP”). It is my understanding that the WFPP provides tax credits to farmers that meet
9 program standards and are located in farmland preservation zoning districts or on land
10 covered by a farmland preservation agreement, or both. Thus, it is my understanding that
11 the WFPP is a tax incentive program only and does not regulate the development of projects
12 – including the Grant County Solar Project.²

13 A separate federal program, the Conservation Reserve Program (“CRP”)
14 administered by the Farm Service Agency, provides financial support to landowners who
15 voluntarily contract to enroll lands into the program. It is my understanding that CRP
16 participants typically agree to implement conservation practices on enrolled lands for
17 contracts of 10 to 15 years in length. The CRP does not regulate the development of
18 projects—including the Grant County Solar Project.³

² *See Ex.-Grant County Solar-Locker-8.*

³ *See Ex.-Grant County Solar-Locker-9.*

1 **Q. Does the designation of land under the Farmland Policy Protection Act preclude the**
2 **development of the Project Site as a solar facility?**

3 A. No. As described above, the Project is not subject to the FPPA because it is not a federal
4 project and does not use federal funding. With respect to the WFPP, as discussed on page
5 13 of my Direct Testimony, Grant County Solar consulted with the DATCP and confirmed
6 that there are no effective farmland preservation agreements in the Town of Potosi. (*See*
7 *Ex.-Grant County Solar-Application: Appendix P*). In addition, the Grant County branch
8 of the Farm Service Agency confirmed that no lands within the Project Study Area are
9 currently enrolled in the CRP or Conservation Reserve Enhancement Program.

10 **Q. GCI witness Cray asserts that if the Project is constructed, the Project Site “will never**
11 **be the same,” likely “will never be re-farmed,” and “there is no guarantee that the**
12 **land can [ever] be returned to cultivation.” (Direct-GCI-Cray-9). How do you**
13 **respond to Mr. Cray’s assertions?**

14 A. As set forth in Sections 1.7.3 and 5.13.6 of the Application and discussed on page 14 of
15 my Direct Testimony, the construction and operation of the Project will involve minimal
16 soil disturbance. Grant County Solar will minimize the amount of grading that is required
17 to reduce disruption to the valuable topsoil. Importantly, construction and operation of the
18 Project is not anticipated to significantly change the soil nutrient content in the Project Site.
19 Moreover, the Vegetation Management Plan for the Project will stabilize soil following
20 construction activities and protect neighboring crop fields and natural areas by minimizing
21 the establishment of invasive vegetation and noxious weeds, thereby maintaining or
22 improving the health of the soil for future agricultural use. The temporary removal from
23 agricultural usage during the lifespan of the Project will reduce the runoff from pesticides

1 and allow the land to rest as managed perennial grassland. Vegetation management will be
2 completed primarily through mechanical means, with targeted herbicide use as needed for
3 invasive vegetation and noxious weeds.

4 To facilitate a return to agricultural use following decommissioning, the land would
5 be tilled to break the new vegetative growth, which will enhance the topsoil condition.
6 Preliminary seeding and re-vegetation plans are provided in CONFIDENTIAL Appendix
7 H – Vegetation Management Plan. Locations on the Project Site that have been compacted
8 or excavated and backfilled will be graded and decompacted, as necessary, to restore the
9 land to conditions suitable for agricultural or other pre-construction land use. If present,
10 drain tiles that have been damaged will be repaired or replaced to at least pre-construction
11 condition. Topsoil will be placed on disturbed areas and seeded with appropriate vegetation
12 or in coordination with landowners within agricultural land.

13 Once the Project is fully decommissioned, each property owner can sample the soils
14 and, as needed, add fertilizer to match the crop(s) to be planted. As such, it is very likely
15 the cropland will be returned to pre-construction yields. Accordingly, once the Project site
16 is fully decommissioned the property owners will be able to return the land to agricultural
17 use. Lastly, Grant County Solar will not be exercising powers of eminent domain and all
18 land rights for the Project have been executed through voluntary lease agreements.

19 As described above and in the preceding sections, Grant County Solar has avoided
20 all wetlands and waterways with 20-foot and 75-foot setbacks, minimized clearing of
21 wooded areas and grading activities to the extent practicable, designed the majority of the
22 Project Site to be stabilized with perennial vegetation and committed to the long term

1 management of the vegetation, and designed the Project such that the site can return to
2 agricultural practices after decommissioning.

3 For these reasons, the Project is in the public interest, will not create any individual
4 hardships, and will not have an undue adverse impact on environmental values such as
5 ecological balance or the public health and welfare. *See Wis. Stat. §§ 196.491(3)(d)3 and*
6 *4.*

7 **Visibility**

8 **Q. GCI witness Cray claims that the Project will result in changes to the viewshed that**
9 **impact individuals living both near the Project Site and outside the area. (Direct-**
10 **GCI-Cray-8.) Was a visual resources study performed for the Project?**

11 A. Yes. As set forth on pages 16-17 of my Direct Testimony, a study of visual resources
12 within the Project Site was completed to compare the existing conditions to the expected
13 visual landscape upon completion of the Project. In order to best document the change of
14 viewshed due to the installation of the Project, five (5) photograph locations were selected
15 based on the presence of sensitive receptors, public thoroughfares, aerial imagery,
16 topography, and proposed Project infrastructure. Photograph location selection was
17 coordinated and approved by Commission staff. Photographs were provided of current
18 conditions and a simulated image of each expected view after construction of the Project
19 is complete, including all Project infrastructure proposed within the viewshed (*e.g.*,
20 substation, panel arrays, fencing). (*See Ex.-Grant County Solar-Application: Appendix*
21 *K*). The photograph locations are mapped along with the proposed Project Site layout in
22 *Ex.-Grant County Solar-Locker-7.*

1 The visual resources study demonstrates that although PV arrays would be visible
2 and identifiable while in close proximity, due to the rolling topography, in broader, more
3 long-distance views, the Project is likely to appear mostly absorbed into the existing
4 agricultural landscape. The rows of PV arrays would appear consistent with a general
5 pattern of row and field crops. The Project would be segmented with portions partitioned
6 by existing natural features, such as avoided riparian corridors, wooded areas, and tree
7 lines. The PV arrays would appear as part of a larger, working landscape, which already
8 contains elements of mechanization and electrical transmission. The segmented layout of
9 the Project would also result in a relatively few number of views within which the Project
10 would appear to dominate the landscape. The visual appearance of the Project, therefore,
11 will not create any undue adverse impacts on environmental values such as the aesthetics
12 of land and water. *See* Wis. Stat. §§ 196.491(3)(d)4. The Photo Simulation Report
13 including the simulated views is provided in Appendix K of the Application (Ex.-Grant
14 County Solar-Application: Appendix K).

15 **Q. Were photo simulations conducted from the Cray and Frear properties?**

16 A. Yes. The Photo Simulations report included as Ex.-Grant County Solar-Application:
17 Appendix K incorporates the anticipated viewsheds from the Cray and Frear properties (*see*
18 Ex.-Grant County Solar-Locker-7). Photo Location 4 was selected to document the change
19 in viewshed from the residence of the Cray property. The photo was taken from the public
20 right-of-way of Lone Elm Tree Road, facing south towards the property. The photo depicts
21 no change in the property itself, though panel arrays will be visible within the background
22 view to the southwest (Array Area 6) and more distantly to the southeast (Array Area 7).

1 The location of the residence within a slight topographic depression is projected to limit
2 the view of Project components.

3 Photo Location 5 was taken from the public right-of-way along U.S. Highway 61,
4 facing west towards the Project directly across from the Boice Prairie Cemetery. The
5 cemetery abuts the Frear property to the north, and as such the viewshed is expected to be
6 very similar. The simulation photograph depicts solar panel Array Area 13 extending
7 downslope from the road to the riparian corridor edge, obscuring most of the foreground
8 view. The Frear property is located approximately 680 feet south of Photo Location 5 and
9 is partially across from an avoided riparian corridor between array Areas 12 and 13. Due
10 to the rolling topography of the overall area and avoided riparian corridors, distance views
11 of the agricultural landscape are retained. The proposed Project will also border the Frear
12 property to the south, with the fence line approximately 1,160 feet (0.2 miles) south from
13 the residence. The Project array to the south is upslope from the residence, which will limit
14 the extent of the Project visible to the Frear residence.

15 **Q. Is Grant County Solar willing to work with landowners to mitigate potential visual**
16 **impacts?**

17 A. As set forth in the Direct Testimony of Grant County Solar witness David Gil, Grant
18 County Solar will consider reasonable requests for vegetation screening or other similar
19 measures if requested by non-participating landowners on a case by case basis where it
20 does not result in an adverse impact to Project operations.

1 Vegetation Management

2 **Q. GCI witnesses claim there is the “potential for the spread of weeds from the project**
3 **to our property.” (Direct-GCI-Cray-11). Does Grant County Solar have a plan to**
4 **manage vegetation on the Project Site?**

5 A. Yes. In Section 5.4.2 of the CPCN application, Grant County Solar describes mitigation
6 actions that will be implemented during construction to minimize the spread of invasive
7 species and noxious weeds. Machinery will be cleaned prior to delivery. If cleaning is
8 needed throughout construction, cleaning will take place on aggregate in the laydown yard.
9 To prevent the spread of invasive species into other areas to the extent practicable, all
10 equipment used, including construction matting, will be cleaned prior to work in areas
11 without invasive species. If possible, construction matting for use in invasive species areas
12 will be designated prior to the start of construction to minimize the time and expense
13 needed to clean the mats.

14 For post-construction management, Grant County Solar provided a Vegetation
15 Management Plan for the Project in Appendix H to the Application (Ex.-Grant County
16 Solar-Application: Appendix H). The Vegetation Management Plan identifies practices
17 Grant County Solar will follow to maintain and potentially improve soil health, a
18 preliminary schedule for seeding and maintenance, permanent seed mix design and
19 installation locations, seed bed preparation, and vegetation maintenance for the duration of
20 the Project. The Plan is based on seed mixes that are readily available with the
21 understanding that seed availability, final Project engineering, and other factors may
22 warrant changes closer to the time of seeding. The Vegetation Management Plan also
23 provides guidance on strategies and recommended timing for management of invasive and

1 incompatible weed species within the planting areas. Regular maintenance will primarily
2 be completed through mowing. Herbicide treatment for invasive vegetation and noxious
3 weeds will likely be implemented prior to permanent seeding and in spot treatments as
4 needed throughout the life of the Project, though needs are anticipated to be minimal after
5 the perennial seed mix is established. All necessary herbicide treatments will be applied
6 by a certified professional holding a valid Commercial Pesticide Applicator license with
7 the DATCP.

8 Lastly, the Vegetation Management Plan is compatible and designed to comply
9 with the Project Stormwater Management and Erosion and Sediment Control Plans that
10 will be reviewed and approved when the Project obtains authorization under the WDNR
11 Stormwater General Permit. The Vegetation Management Plan supports the conclusion
12 that the Project is in the public interest concerning environmental factors, *see* Wis. Stat.
13 §§ 196.491(3)(d)3, and that the Project will not create any undue adverse impacts to
14 environmental values including ecological balance and public health and welfare. *See* Wis.
15 Stat. §§ 196.491(3)(d)4.

16 **Q. GCI witnesses state they are “concerned about the potential for the use of chemicals
17 for weed control.” (Direct-GCI-Cray-11). Will chemicals be used for weed control?**

18 A. Yes, however, herbicide treatments are expected to be minimal. Such treatments are likely
19 to be used post-construction and prior to permanent seeding to prevent the establishment
20 of invasive vegetation and noxious weeds. Targeted spot treatments may also be used as
21 needed throughout the life of the Project. Any herbicide applications will be performed by
22 certified applicators and use herbicides in accordance with the DATCP and WDNR

1 guidelines. Once the perennial seed mix is established within the Project Site, management
2 of invasive species and noxious weeds is anticipated to be minimal.

3 **Q. GCI witness Reynolds questions how vegetation can be established and maintained**
4 **under panels. (Direct-GCI-Reynolds-4.) Can vegetation be established under solar**
5 **panels?**

6 A. Yes. The perennial seed mix was selected to include low-growing, shade tolerant species.
7 Photographs in Appendix Z to the Application depict vegetative cover during the summer
8 months beneath and around solar arrays for the Moore and Sombra Solar Energy Centers
9 in Ontario, Canada. (Ex.-Grant County Solar-Application: Appendix Z).

10 **Q. Will the Vegetation Management Plan have other environmental benefits?**

11 A. Yes. As described in the Vegetation Management Plan, the Project will enhance
12 stormwater infiltration, reduce storm water and runoff erosion, benefit planting pollinator-
13 friendly species, and limit the spread of unwanted, invasive, or noxious species within and
14 from the Project Site. The use of herbicides for targeted spot treatments of invasive
15 vegetation and noxious weeds is anticipated to be minimal, resulting in an overall decrease
16 in herbicide/pesticide use compared to typical agricultural practice. During operation of
17 the Project, potentially harmful agricultural runoff will be reduced, and soil quality will
18 likely improve on the Project Site.

19 **Photovoltaic Heat Island Effect (“PHVI”)**

20 **Q. The GCI witnesses express concern that the Project will produce a PHVI effect that**
21 **will result in significant adverse impacts to local agriculture production. (Direct-GCI-**
22 **Adrian-1, 6-7; Direct-GCI-Frear-11; Direct-GCI-Reynolds-2). Does the Project pose**
23 **a significant risk due to potential PHVI effects?**

1 A. No. As set forth in my Direct testimony, and discussed more fully in Ex.-Grant County
2 Solar- Locker-5: Grant County Solar Response to Public Service Commission of
3 Wisconsin Data Request 2.01 and in Response to Grant County Intervenors Data Request
4 GCI-6.4 to 6.11, measurement-based studies evaluating the potential PVHI effect do not
5 indicate a consistent pattern of significant temperature differences. For instance, initial
6 data from Demirezen et al. (2018) did not identify statistically significant differences in
7 temperature distributions inside and outside the array for any timeframe. Moreover,
8 Armstrong et al., (2017), provided in Response to GCI Data Request No. 6.4, indicated
9 potential localized air and soil temperature cooling directly beneath or between arrays at a
10 fully vegetated solar facility in the southern United Kingdom.

11 Taken collectively, the studies indicate that any effect on air temperature is highly
12 localized. Armstrong et al., (2017), the only study conducted at a site with similar climate
13 and vegetation characteristics to the proposed Project, did not show a significant increase
14 in air or soil temperatures. Based on the studies, it can be concluded that any potential
15 increases in air temperature are limited to the space directly above, and in very close
16 proximity to, the solar arrays. Any increase will quickly dissipate with distance from the
17 array perimeter due to daytime convective mixing. The panels are likely to cool at night.
18 Moreover, the presence of access roads between arrays and re-vegetation under and around
19 the arrays will have additional cooling effects.

20 In addition, the temperate climate of the Project Site will further reduce any
21 potential PVHI effect. In contrast to the majority of studies documenting the PVHI effect,
22 the Grant County Solar Project is located in a temperate region. Importantly, studies on
23 the PVHI effect hypothesis have primarily been conducted in arid and semiarid landscapes

1 (e.g., Arizona) on solar facilities with bare ground beneath and around arrays. However,
2 background temperatures could greatly impact the PVHI effect. For example, the theory
3 of PVHI has been compared to the better-documented Urban Heat Island (“UHI”) effect,
4 which measures the temperature impact of human activity in urban areas. Studies have
5 found that the UHI effect varies with background temperatures, such that the magnitude of
6 the UHI effect was greater in areas with higher temperatures. As demonstrated with the
7 climate data provided in my Direct Testimony, Lancaster, Wisconsin is consistently cooler
8 than southern Arizona in both maximum and minimum temperatures across all seasons.

9 Although the magnitude of potential impact from PVHI is much smaller than that
10 of UHI, researchers are drawing on strategies identified by UHI studies to reduce any
11 potential PVHI effect. Primary among these strategies is the implementation of vegetation
12 to provide cooling benefits through ground shading and evapotranspiration. Ground
13 shading, such as that produced by PV panels or underlying vegetation, reduces surface
14 temperatures by reducing the amount of solar radiation that reaches and is absorbed by the
15 ground. Evapotranspiration combines evaporation, the conversion of liquid water to water
16 vapor, and transpiration, the process by which plants absorb water through their roots and
17 emit it through their leaves. Evapotranspiration uses heat from the air to evaporate
18 transpired water, thereby providing a cooling effect. In fact, research in southern Arizona
19 demonstrated that PV installations that were revegetated with grasses under the panels had
20 a strong cooling effect, significantly lowering air temperatures within the array when
21 compared to arrays underlain by bare ground. (*See Ex.-Grant County Solar-Locker-5*).

22 Significantly, the Project Site will be planted with perennial vegetation beneath and
23 around arrays. A Vegetation Management Plan was developed and submitted in Appendix

1 H – Vegetation Management Plan to CPCN Application (docket reference # 389287 and
2 389287) to ensure the long-term condition of the on-site vegetation, providing further
3 cooling.

4 Due to the documented dissipation of PVHI with distance from the facility, the
5 decreased PVHI effect anticipated for lower background temperatures, and the anticipated
6 temperature reducing effects of vegetation established beneath and around the arrays, the
7 PVHI effect will not result in a significant impact to the community surrounding the
8 Project.

9 **Q. GCI witnesses assert that “homes, crops, and livestock would potentially experience
10 climate change within 300 meters of the solar farm.” (Direct-GCI-Frear-11). Do you
11 agree?**

12 A. No. As stated and documented in Grant County Solar’s Responses to GCI Data Request
13 No. 6.4 through 6.11, there is a low risk for the Project to have a significant effect on
14 temperature. Armstrong et. al. (2017), the only study conducted at a site with similar
15 climate and vegetation characteristics to the proposed Project, did not show a significant
16 increase in air or soil temperatures. The studies provided in Ex-Grant County Intervenors-
17 Frear-5 all present different patterns of findings, with Demirezen et al. (2018) finding no
18 significant differences in temperature distributions for any timeframe. All studies finding
19 an increase in air temperatures associated with the solar array were completed in semiarid
20 locations with bare ground beneath and around arrays.

21 Although Fthenakis and Yu (2013) suggests potential effects on temperature up to
22 300 meters from a solar facility, the study relied on existing weather stations that do not
23 represent a gradient of distance from the facility and whose sensor accuracy for air

1 temperature is only $\pm 0.5^{\circ}\text{C}$. As the stations located 100 meters and 210 meters from the
2 facility differed from the reference station by approximately 0.6 and 0.5°C respectively,
3 the sensor accuracy could have a large impact on the study conclusions. Unfortunately, the
4 study does not present data on variation or certainty. The Barron-Gafford Research Group
5 (2016) research presented in Response to PSCW Data Request 2.01 also used sensors with
6 an accuracy for air temperature of $\pm 0.5^{\circ}\text{C}$ and measured distances from the solar array at
7 10-meter intervals. This study, also conducted in the semiarid southwest on arrays
8 underlain by bare ground, found temperature increases dissipated between 20 and 30
9 meters (approximately 65 to 98 feet) from the array edge. The Barron-Gafford Research
10 Group (2018) further found that PV installations in the semiarid southwest that were
11 revegetated with grasses beneath arrays were significantly cooler than arrays underlain by
12 bare ground. Due to the documented dissipation of potential PVHI effect with distance
13 from the facility, the decreased PVHI effect anticipated for lower background
14 temperatures, and the anticipated temperature reducing effects of vegetation established
15 beneath and around the arrays, the PVHI effect will not result in a significant impact to the
16 community surrounding the Project.

17 **Q. Does this conclude your prefiled rebuttal testimony?**

18 A. Yes it does.